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|                  | <b>TECHNICAL SPECIFICATION</b>                 |        | Nº: I-ET-3010.1M-1350-190-P4X-002 |        |        |        |        |        |        |  |
|   | CLIENT: SRGE                                   |        | SHEET 1 of 12                     |        |        |        |        |        |        |  |
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| DP&T-SRGE   | <b>WORKSHOPS AND WAREHOUSES EQUIPMENT LIST</b> |        | NP-1                              |        |        |        |        |        |        |  |
|   |  |        |                                   | ESUP   |        |        |        |        |        |  |
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TITLE:

WORKSHOPS EQUIPMENT LIST

NP-1

ESUP

## SUMMARY

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PRELIMINARY

## 1 OBJECTIVE

This document define a list specification of equipment to be supplied and installed at: Electrical Workshop, Instrumentation and Calibration Workshop, Mechanical Workshop and PSV calibration Workshop.

## 2 Electrical Workshop Equipment List

|    |   |    |
|----|---|----|
| 01 | <b>POWER QUALITY ANALYZER</b><br>Safety Rating: 600V, CAT III<br>Features: Measures voltage, current and power harmonics, captures voltage sags, transients, and inrush currents; Measures frequency, resistance, diode voltage drop, continuity, and capacitance; Measures Total Harmonic Distortion (THD) and phase angle of individual harmonics; True RMS voltage and current; Complete set of accessories (Test leads, Probes, Clips, charger and Manuals) | 01 |
| 02 | <b>SCOPEMETER TEST</b> Digital troubleshooting; oscilloscope function, double channel, 20 MHz; Automatic setup measurements; NiCd battery operation and charger; Advanced measurements: temperature, current, % duty, dB, Hz, voltage ); 600V CAT III   | 01 |
| 03 | <b>5 DIGIT LCD PHOTO DIGITAL TACHOMETER</b><br>Microprocessor based with quartz crystal oscillator; tachometer memory stores last max. and min. readings.<br>Range ( RPM ) – 2.5 to 10,000 Accuracy – 0.05%   | 01 |
| 04 | <b>"CHUBBY" BATTERY CHARGING SET</b><br>Intake: 110/220 VAC, 2,000 W / 5-position selector switch; Output: 6 to 150 V DC / 3 position selector switch; Fine adjustment: 12 positions (1V); Cables: M-7, 1.2 meters each; mounted on wheels for transport  | 01 |
| 05 | <b>RELAY TESTING UNIT</b><br>Intake – 220VAC / 60Hz; Power rating: 1 KVA; Outlets: 0-300V/0-0.5A AC, 0-220V/2A AC, 0-150V/0-1A AC, 0-115V/3A AC, 0- 80V/12.5A AC, 0- 40V/25 A AC, 0- 24V/0-8A AC, 0-20V/50 A AC, 0- 10V/100A AC, 0-300V/0-0.5A DC, 0-150V/0-1A DC, 0- 24V/0-4A DC   | 01 |
| 06 | <b>3-PHASE VOLTAGE VARIATION UNIT</b><br>Maximum power rating: 4.5 KVA; Input voltage: 220 V; Outlet voltage: 0 to 240 V; Outlet current: 11 A; Connection: Star with neutral   | 01 |

|    |  |    |
|----|--|----|
| 07 | <b>ELECTRICAL TEST BENCH</b><br>Average dimension: length-1500mm; total height-1700mm; height from floor to panel-800mm; width-700mm; with 6 lower shelves; it shall be furnished with the following electrical devices:<br>Incoming and outgoing circuit breakers; supply available; 3 phases / 480V / 100A test circuit; 3 Phases / 480V / 50A test circuit; 3 phases / 220V / 30A test circuit; 1 phase / 127V / 30A test circuit; DC 0 to 32V / 3A power supply; AC 260V / 5A variable source; DC 24V / 15A test circuit with source; DC 125V / 15A test circuit with source; fragment lamp sockets E-27 and E-40; mercury lamp sockets E-27 and E-40, continuity test circuit with buzzer; fluorescent lamp test circuit for 2 lamps of 40W; fluorescent lamp test circuit for 2 lamps of 20W; 127VAC / 15A socket; 220VAC / 15A socket; earth leakage relay; rocker switch for 260VAC source; rocker switch for 0 to 32VDC / 3A; MCB for 3 phase / 480V /100A test circuit; MCB for 3 phase / 480V / 50A test circuit; MCB for 3 phase / 220V / 30A test circuit; MCB for 1 phase / 127V / 30A test circuit; MCB for 125VDC / 15A test circuit; MCB for 24VDC / 15A test circuit; standard ammeters precision 0,5%, 0 to 5A and 0 to 25A; standard voltmeters precision 0,5%, 0 to 30VDC, 0 to 150VDC, 0 to 150VAC, 0 to 300VAC, 0 to 600VAC | 01 |
| 08 | <b>FIBERGLASS STEPLADDER</b><br>Load capacity - 300lbs<br>Height – 5' (feet)<br>Load capacity – 300lbs<br>Height – 3' ( feet )   | 01 |
| 09 | <b>WORK DESK</b> With 3 lower shelves on each side   | 02 |
| 10 | <b>WORK BENCH</b><br>With one rotary vise number 4"; Structure and top plate (1/2 inch thick) built of steel; top plate covered with wood (1 inch thick); final top cover in rubber sheet (1/8 or 3/16 inch thick); With six drawers on a side; Dimensions: length: 1800mm; width: 890mm; heigth:900mm   | 01 |
| 11 | <b>WORK CHAIR</b> Swiveling Type, with adjusting height, wheels and armrest  | 02 |
| 12 | <b>MEDIUM VOLTAGE BAR PROBE / TESTER</b><br>Measure up to 40 KV dc or 28 KV (RMS) AC; 1000 MΩ input resistance   | 01 |
| 13 | <b>INDUSTRIAL VACUUM CLEANER</b><br>Power rating 930 W; Suction capacity: 3,000 l/min; Vacuum: 1,300 mm.c.a. Intake – 220VAC   | 01 |

|    |   |    |
|----|---|----|
| 14 | INSTRUMENT CABINET Built of galvanized and painted steel with shelves, doors and pad lock | 02 |
| 15 | WHITE BOARD Size: 90 x 60 cm  | 02 |

### 3 Instrument and Calibration Workshop Equipment List

|    |   |    |
|----|---|----|
| 01 | INDUSTRIAL VACUUM CLEANER<br>Power rating 930 W; Suction capacity: 3,000 l/min; Vacuum: 1,300 mm.c.a. Intake – 220VAC   | 01 |
| 02 | PORTABLE THERMOSTATIC BATH<br>Temp. range: room up to 250 °C; Resolution: 0.1 °C; Sensor: thermo-resistance PT500; Gauge: LCD, 4 digit; Adjustment: 0.08 °C (normal) / 0.01 °C (fine adjustment); Volume of vessel: 10 liters   | 01 |
| 03 | HYDRAULIC SCREW-TYPE PUMP<br>For calibrating pressure; Maximum pressure: 500 kgf/cm <sup>2</sup> ; Fluid: De-mineralized water; Branch line connections: 1/2" BSP; Finish: Black epoxy electrostatic  | 02 |
| 04 | PORTABLE DIGITAL PROCESS CALIBRATOR<br>Gauge: 3 1/2 digits; Accuracy: 0,01%; Source/Measure temperature, pressure, voltage, current, resistance and frequency; Module provide pressure calibration capability to 10.000psi / 700bar; Range current full scale: 30.000mAdc | 02 |
| 05 | DEAD WEIGHT CALIBRATOR Maximum pressure: 350kgf/cm <sup>2</sup> ; Precision: 0.1% full scale; Casing made of aluminum alloy; Plunger of stainless steel; Volume of vessel: 700 ml   | 01 |
| 06 | STABILIZING SOURCE Triple outlet; Adjustment: 0.01%; Voltage: 0 + 36V (dual); Current: 0 to 5A; Independent / interlinked operations  | 02 |
| 07 | DIGITAL FREQUENCIMETER<br>Range: 20 Hz to 60 MHz; Sensitivity: 50 mV RMS (20Hz/20MHz); sensitivity: 100 mV RMS (20MHz/40MHz); Input: 240 V (20 Hz/100 KHz), 100 V (1 MHz) and 25 V (40MHz); Impedance: 1 MΩ / 100pf   | 01 |
| 08 | PNEUMATIC CALIBRATION CASE<br>Digital read-out; Pressure: -4 to 31 psi; range: -100 to 860' H <sub>2</sub> O; % of span: (0%-3psi/100%-15psi); Precision: 0.01% of span; Repeating rate: 0.02% of span; Current gauge: 4 to 20mA  | 02 |



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TITLE:

**WORKSHOPS EQUIPMENT LIST**

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|    |  |            |
|----|--|------------|
| 09 | <p><b>SET OF STANDARD MANOMETERS</b><br/> Tolerance: 0.25% x span; Gauge: 6" diameter; Bourdon: stainless steel, scales: 0 - 4.0 kgf/cm<sup>2</sup>; 0 - 10.0 kgf/cm<sup>2</sup>; 0 - 40.0 kgf/cm<sup>2</sup>; 0 - 70.0 kgf/cm<sup>2</sup>; 0 - 250.0 kgf/cm<sup>2</sup>, 0 - 400 kgf/cm<sup>2</sup> With indications in psi and Kgf/cm<sup>2</sup></p>  | 02         |
| 10 | <p><b>DIGITAL PORTABLE OSCILLOSCOPE</b><br/> Frequency: 60 MHz; double channel; Input impedance: 1MΩ/20 pF; Maximum Input Voltage 400V (DC + AC PEAK) Vertical deflection: 5mV at 5V/division; Sequence: 1-2-5, 10 positions; Vertical travel time: 10 ns (50 MHz), 5 ns (60 MHz); Screen: 8X10 Div (1 div.=10mm) viewing area; parallax-free; display of menus; setting; status indication</p>  | 01         |
| 11 | <p><b>SET OF STANDARD THERMOMETERS</b><br/> Decimal internal scale; Transparent capillary tube; Filled with mercury; Length: 550 mm; Diameter: 12 mm; Resolution: 0.1°C; scales: - 38°C to + 15°C, - 10°C to + 52 °C, + 48°C to +102 °C, + 98°C to +152 °C, +148°C to +202 °C, +198°C to +252 °C</p>   | 02 of each |
| 12 | <p><b>INSTRUMENTATION TEST BENCH</b><br/> All Bench plates and structure shall be made of stainless steel AISI 316 Average dimension: length-1500mm; total height-1700mm; height from floor to panel-800mm; width-700mm; with 6 lower shelves; it shall be furnished with the following electrical and instruments devices: Incoming and outgoing circuit breakers; supply variable 125VDC / 10A and 24VDC / 5A; 0 to 50 VDC variable source; DC mA source with 0 to 20mA; 0 to 10 mA; digital manometer; 0 to 1 Kgf/cm<sup>2</sup> primary gauge with double scale (kgf/cm<sup>2</sup> and kPa); 0 to 10 Kgf/cm<sup>2</sup> primary gauge with double scale (kgf/cm<sup>2</sup> and kPa); -1 to 0 kgf/cm<sup>2</sup> primary gauge with double scale (kgf/cm<sup>2</sup> and kPa); 0 to 25 kgf/cm<sup>2</sup> primary gauge with double scale (kgf/cm<sup>2</sup> and kPa); vacuum source; incoming air regulator; 0 to 1 kgf/cm<sup>2</sup>/ 0 to 2 kgf/cm<sup>2</sup>/ 0 to 4kgf/cm<sup>2</sup>/ 0 to 12 kgf/cm<sup>2</sup> sources</p> | 01         |
| 13 | <p><b>ELECTRONIC TEST BENCH</b><br/> All Bench plates and structure shall be made of stainless steel AISI 316 Average dimension: length-1500mm; total height-1700mm; height from floor to panel-800mm; width -700mm; with 6 lower shelves; it shall be furnished with the following electrical and instruments devices: Incoming and outgoing circuit breakers; supply variable 125VDC/ 10A and 24VDC/ 5A; 0 to 50 VDC variable source; DC mA source with 0 to 20mA; 0 to 10 mA; variance; decade resistance box; frequency counter – function generator scope; digital oscilloscope double channel, trigger out, 60 MHz, Input impedance: 1 MΩ/ 20 pF; Maximum Input Voltage 400V (DC + AC PEAK) Vertical deflection: 5mV at 5V/division; DC</p>  | 01         |

|    |   |    |
|----|---|----|
|    | power source; Function generator, display six digits, frequency range 0,1 hz, 22 MHz, outlet impedance 50Ω, resolution 1 Hz (1s)/ 10 Hz (0,1s), waves models: burst, sinusoidal, triangular, square, sweep, external, frequency meter 5 Hz to 10 MHz; digital multimeter; variable air source 0 to 10 Kgf/cm <sup>2</sup> |    |
| 14 | WORK DESK With 3 lower shelves on each side   | 01 |
| 15 | WORK BENCH<br>With one rotary vise number 4"; Structure and top plate (1/2" thick) built of steel; top plate covered with wood (1" thick); final top cover in rubber sheet (1/8 or 3/16" thick); With six drawers on a side; Dimensions: length: 1800mm; width: 890mm; height:900 mm                                      | 01 |
| 16 | WORK CHAIR<br>Swiveling Type, with adjusting height, wheels and armrest   | 02 |
| 17 | INSTRUMENT CABINET<br>Built of galvanized and painted steel with shelves, doors and pad lock  | 02 |
| 18 | WHITE BOARD Dimension – 90 x 60 cm  | 02 |

#### 4 Mechanical Workshop Equipment List

|    |   |            |
|----|---|------------|
| 01 | DEVICE FOR TESTING DIESEL ENGINE INJECTION NOZZLES  | 01         |
| 02 | HIGH PRESSURE HAND FEED PUMP<br>For adjusting point of injection of diesel engines  | 01         |
| 03 | HYDRAULIC JACK<br>Capacity 10 ton, with manual pump   | 01         |
| 04 | PISTOL TYPE PNEUMATIC DRILL<br>Maximum power 0.65 kW, capacity 5/8", 600 rpm  | 01         |
| 05 | PNEUMATIC IMPACT SWITCH<br>Light duty, 40 to 150 Nm or 27 to 163 Nm (pistol type)<br>Medium duty, 100 to 550 Nm (pistol type) | 01 of each |
| 06 | TIRFOR WINCH-TYPE HOIST<br>With capacity for 1,500 to 2,000 kg  | 01         |

|    |   |                 |
|----|---|-----------------|
| 07 | TIRFOR WINCH-TYPE HOIST<br>With capacity for 3,000 to 4,000 kg  | 01              |
| 08 | HIGH VACUUM PUMP<br>Double stage portable type, 110 – 220 V; 1750 rpm; 373 to 703 mm/hg; for VAC equipment maintenance  | 01              |
| 09 | INDUSTRIAL HAND TRUCKS<br>Welding-machine type<br>For small works (with 02 platforms)<br>For oil pouring<br>With mechanical lift for 200 kg<br>Turtle type                          | 01 of each type |
| 10 | HIDRAULIC PRESS<br>With manual action, 100 ton (principal) and 15 ton (auxiliary) capacities  | 01              |
| 11 | ROTARY VISE<br>Size number 4", built of nodular cast iron   | 02              |
| 12 | ROTARY VISE<br>Size number 7", built of nodular cast iron   | 02              |
| 13 | ANALYSER AND VIBRATION COLLECTOR SYSTEM   | 01              |
| 14 | PNEUMATIC OIL DRIVE PUMP  | 01              |
| 15 | JOINT CUTTING MACHINE<br>For diameters from 80 to 1250 mm, maximum thickness 9 mm   | 01              |
| 16 | ELECTRICAL UNIT FOR UNCLOGGING PIPES<br>For pipes sized 3/4" to 3", with 5/8", 5/16" and 3/8" spiral cables   | 01              |
| 17 | ULTRASONIC-ACTION CLEANING TANK   | 01              |
| 18 | HAND PUMP FOR GREASE<br>With side lever, 500 gram capacity  | 05              |
| 19 | PNEUMATIC OIL DRIVE PUMP  | 01              |
| 20 | HAND PUMP FOR GREASE<br>Maximum 200 liter oil drums   | 02              |
| 21 | WASHING TANK<br>With electrical pump and closed circuit for pressurized washing fluid; built of stainless steel 316.<br>Dimension: 1,0 x 0,5 x 0,5 mm provide fume exhausted system | 01              |



|    |   |                 |
|----|---|-----------------|
| 22 | AUTOMATIC SAWING MACHINE<br>Hydraulic type, 1 HP, cutting capacity 320 x 400 mm   | 01              |
| 23 | GRINDING MACHINE<br>Column-mounted type, hard duty, 1 HP, for 8" grinding wheels capacity, Bench-mounted type, medium duty, ½ HP, for 6" grinding wheels capacity Industrial portable type, 220VCA, 5" Pneumatic angular type, 4"   | 01 of each type |
| 24 | COLUMN-MOUNTED DRILLING MACHINE<br>With inclinable table, 2 HP, 38 mm drilling capacity<br>Digital scale  | 01              |
| 25 | UNIVERSAL ENGINE LATHE<br>With complete set of accessories  | 01              |
| 26 | PORTABLE DYNAMOMETER<br>With 1,000 kgf capacity   | 01              |
| 27 | ELECTRIC THREADING CHASER<br>For pipes sized 1/8" to 2" and rebar sized 1/4" to 2"  | 01              |
| 28 | TORQUE MULTIPLIER<br>Multiplying ratio 3.6 x 1, max. capacity 2000 lbf.ft   | 01              |
| 29 | CHAIN BLOCK<br>Capacity 0.5 ton<br>Capacity 1.0 ton<br>Capacity 1.5 ton<br>Capacity 3.0 ton<br>Capacity 5.0 ton   | 01 of each type |
| 30 | INDUCTIVE HEATER FOR BEARINGS<br>Digital control; double power; harmless to the environment; automatic de-magnetization; for internal diameter from 20 to 150 mm; external diameter 300 mm  | 01              |
| 31 | EXHAUST PUMP<br>Simple pneumatic type<br>Double pneumatic type  | 01 of each type |
| 32 | WORKBENCH<br>With one rotary vise number 4", electrical socket outlet (110/220 V – 5 kW) and air for pneumatic tools; Structure and top plate (1/2" thick) built of steel; top plate covered with wood (1" thick); final top cover in rubber sheet (1/8 or 3/16" thick); With six drawers on a side; Dimensions: length: 1800mm; width: 890mm; height: 900 mm | 02              |

|    |  |    |
|----|--|----|
| 33 | WORK DESK  | 01 |
| 34 | WORK CHAIR<br>Swiveling Type, with adjusting height, wheels and armrest.                     | 02 |
| 35 | EQUIPMENT CABINET<br>Built of galvanized and painted steel with shelves, doors and padlock   | 03 |
| 36 | EQUIPMENT CABINET<br>Built of galvanized and painted steel with shelves for toolboxes        | 01 |
| 37 | NOTICE BOARD   | 02 |
| 38 | OPTICAL DIGITAL TACHOMETER<br>With five digit display  | 01 |
| 39 | PLATE BENDER<br>For 1/8" thickness plates  | 01 |
| 40 | TELESCOPIC MANUAL STACKER<br>Sized 1120mm x 800mm, maximum stacking height 2500mm            | 01 |
| 41 | PORTABLE HYDRAULIC FLUID FILTRATION UNIT<br>Provide oil lubricant points inside the workshop | 01 |
| 42 | MONORAIL FOR 3 TON CHAIN BLOCK   | 01 |
| 43 | MILLING MACHINE<br>With accessories  | 01 |

## 5 Pressure Safe Valve Calibration Workshop Equipment List

|    |  |    |
|----|--|----|
| 01 | <b>TEST BENCH FOR PSV CALIBRATION</b><br><br>Rigid structure in carbon steel, with removable lateral covers for internal maintenance, with test bench up to 750 mm, with mechanical fastening system for flanged psv, with minimum 4 grips, tighten by manual wrench or tool, not hydraulic, and with female thread to assembly the threaded connexion of the psv. It is necessary to provide a base to install the test bench, with a high referring to the model that will be acquire. | 01 |
|----|--|----|



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It shall proper to calibrate PSVs from 1/4" to 2" NPT (male and female) and from 1/4" to 3/4" BSPP (male and female), including male and female adapters.

It shall proper to calibrate PSV with flange connections from 1/2" to 10", pressure classe from 150# to 1500#, including flange connection WITH RAISED FACE (RF) and flange connection by joint ring (RTJ) including adapters;

NOTE: Limit pressure 1500# for 4" PSV

Limit pressure 600# from 4 to 6" PSV.

Limit pressure 300# from 6" to 8" PSV

It shall be proper to calibrate PSV from 0 to 10.000psi, using compressure air, N<sub>2</sub> and water, including double blocked valve and check valve at the line.

The operation board shall be protected by a transparent visor and impact device.

It shall be supplied including a hydraulic pump for maximum pressure of 10.000psi.

Valves of the desktop shall be able to work with pressure above pressure of the calibration system.

Control panel of calibration desktop shall have:

Digital pressure indicator

Digital maximum pressure indicator

Analogic indicator ranges: from 0 to 1; from 0 to 2; from 0 to 6; from 0 to 10; from 0 to 14; from 0 to 20; from 0 to 25; from 0 to 50; from 0 to 70; from 0 to 100; from 0 to 200; from 0 to 400; from 0 to 600 and from 0 to 1000 kg/cm<sup>2</sup>

Precision of 1% for pressure gauge from 0 to 70kg/cm<sup>2</sup>

Precision of 0,5% for pressure gauge from 70 and higher kg/cm<sup>2</sup>

Gauge visor shall be at least 200mm of diameter.

Analogic gauge shall be provided with quick release.

It shall be supplied with a vessel with 5 liter, proper to calibrate PSV of 8-T-10 and/or PSV 3-K-4 of 22000 kPa

Provide an equipment kit for leak test evaluation, made in acrylic or aluminum plates sized for discharge diameters from 1" up to 12".

Provide an additional equipment, combined pump with flywheel type, for PSV calibration of hydraulic system.

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|    |  |    |
|----|--|----|
|    | <p>Industrial workdesk, with high resistance and minimum capacity of 1000 kg.</p> <p>Provide a bench vise number 10".</p> <p>Service area of desktop shall be covered by rubber, with at least 3mm of thickness, proper for impact.</p>  |    |
| 03 | <p><b>WORKBENCH FOR LAPPING</b></p> <p>It must have the minimum items:<br/>PSV lapping kit with:</p> <ul style="list-style-type: none"><li>- 13 lapping/polishing blocks, double sided, for valves "D" through "T" orifice sizes;</li><li>- One lapping plate 10";</li><li>- One lapping plate 6".</li></ul> | 01 |
| 04 | <p><b>INDUSTRIAL CLEANING SYSTEM FOR WASH TOOLS AND PSVs</b></p>   | 01 |
| 05 | <p>WORK DESK</p>   | 01 |
| 06 | <p>WORK CHAIR<br/>Swiveling Type, with adjusting height, wheels and armrest</p>  | 01 |